STORAGE AND INK REFILLING STATION FOR A CARTRIDGE OF A PRINTHEAD

Field of the invention

The present invention relates to a storage and ink refilling station for a cartridge of a printhead, and more particularly to a refilling station perfected to prevent ink from leaking.

Brief description of the state of the art

A similar device is known from European patent No. 605.183 for storing at least one cartridge of an ink jet printhead and for keeping it refilled with ink; this device comprises a container provided with a first chamber suitable for accommodating a cartridge refillable with ink, which can be inserted through an upper aperture, and a second chamber arranged below the first chamber, and separated therefrom by a horizontal wall and suitable for containing the ink with which to refill the cartridge in the first chamber; a cylindrical capillary element is borne by the horizontal wall and has a first end immersed in the ink in the second chamber and a second end protruding into the first chamber and suitable for insertion in the cartridge in contact with a sponge for transferring the ink through capillarity from the second chamber to the cartridge.

This device has the drawback that when the container is turned over on a side or turned upside down, during transport for instance, the capillary element remains in contact with the ink and continues transferring the ink to the cartridge

not only through capillarity but also on account of the head of ink above the capillary element, therefore causing an overfilling of the cartridge with, as a result, ink flowing out of the cartridge. This drawback is most apparent in cases where the cartridge is not in the first chamber, in which case, ink would drip in abundance inside the first chamber.

Summary of the invention

The main object therefore of this invention is that of producing a storing and ink refilling station of a cartridge of a printhead, without the drawback mentioned above.

Another object of this invention is to produce a perfected storing and ink refilling station, in which the cartridge is refilled with ink when the station is in the vertical position, while refilling with ink is interrupted when the storage station is in any other position other than the vertical, in this way avoiding ink dripping or running through the capillary element.

Therefore in accordance with the planned objects of this invention, a storage and ink refilling station for a cartridge of a printhead, comprising a container (4) suitable for containing a predetermined volume of ink (17) in a collection chamber (18), adjacent to a bottom wall (6), serving as a support platform (6a) of the container (4) on a horizontal plane (9), for defining a vertical operating position of the container (4), which also has a housing (10), attached to a top wall (7) of the container (4) and suitable for accommodating the cartridge (2), inserted through an

aperture (12) in the top wall (7), the station (1) also comprising refilling means (24, 26), at least partially immersed in the predetermined quantity of ink (17), when the container (4) is in the vertical operating position, and cooperating with the cartridge for transferring the ink from the collection chamber (18) to the cartridge (2), characterized as defined in the main claim.

This and other characteristics of the invention will appear more clearly from the following description of a preferred embodiment, provided by way of non-restricting example, with reference to the figures in the accompanying drawings.

Brief description of the drawings

Fig. 1 is a cross-sectioned, perspective view of the storing and refilling station, according to the invention;

Fig. 2 is a vertical cross-section, along the median line of the station of Fig. 1;

Fig. 3 is a transversal view, cross-sectioned along the line III-III of Fig. 2;

Fig. 4 represents a cross-sectioned view of the station of Fig. 2 set on one side; and

Fig. 5 is a construction detail of the hydrostatic pressure compensator.

Detailed description of a preferred embodiment

The station 1, in accordance with the present invention, for storing and refilling a cartridge 2 of a printhead, depicted in Fig. 1, comprises a container 4

consisting of a bottom wall 6, a top wall 7, substantially parallel to the bottom wall 6, and at least one side wall 8, integrally attached to the other two walls 6 and 7.

The bottom wall 6 acts as the support platform of the container 4 on a horizontal plane 9, for setting the container in a vertical operating position P1, in order to refill the cartridge 2 with ink, as will be described in greater detail in the following.

The container 4 can indifferently be made in a cylindrical shape, or as a parallelepiped, or a right-angled prism; in the first case, the side wall 8 will be made in a single, continuous piece, substantially shaped as a cylinder trunk; in the second case the side wall 8 will be made of various flat walls, four for instance, 8a, 8b, 8c and 8d, joined together and to the walls 6 and 7.

A substantially parallelepiped shape housing 10 is arranged inside the container 4, and is integrally attached to the top wall 7, in such a way as to extend inside the container 4 in the direction of the bottom wall 6.

The housing 10 is closed at the bottom by a bottom wall 11 and is configured to house the cartridge 2 for a known type printer, not shown in any of the drawings, which cartridge 2 is inserted into the housing 10 through an aperture 12 made in the top wall 7 of the container 4.

The cartridge 2, in particular, according to a non-restrictive version, can be of the type in which an ink jet printhead 5 is integrated with the cartridge 2, as is shown for instance in Fig. 2 as a non-restrictive example; alternatively, the

cartridge 2 can be without a printhead and in this case, can be inserted in an appropriate seat in a printer having its own printhead. Both the mentioned types of cartridge are well known to those acquainted with the sector art, and will not therefore be examined in detail in this description.

The cartridge 2 contains a spongy body 14 normally impregnated with ink at the time of manufacture. When the cartridge 2, at the end of a printing cycle, has finished its original ink, it can be refilled repeatedly with ink by means of the station 1.

The ink 17 is normally contained in a collection chamber 18, arranged in the bottom part of the container 4, and adjacent to the bottom wall 6.

The vertical position P1 of the container 4, shown in Fig. 1, wherein the latter is set with the bottom wall 6 on a horizontal plane 9 (Fig. 1) is accordingly defined as the operating, or refilling, position of the station 1; according to this invention; in this position P1, the ink 17 occupies the collection chamber 18, to a pre-established level H with respect to the base 6, corresponding to a predetermined volume of ink, for instance 200 ml approximately, sufficient to completely refill the cartridge 2 several times.

In fact, according to the main object of the present invention, the cartridge 2, out of ink, is inserted in the housing 10 to be refilled with ink by means of the capillarity phenomenon, in which the ink 17 is transferred into the cartridge 2,

solely and exclusively when the station 1 is arranged with the container 4 set with its base 6 on the horizontal plane 9, that is in the vertical position P1.

For this purpose, the cartridge 2 is provided at the bottom with un underframe 20, in which there is an aperture 22, through which the spongy body 14 faces the outside.

Refilling with ink between the collection chamber 18 and the cartridge 2 takes place through a capillary element 26, of a type known in the sector art, which is attached to the housing 10 and extends vertically inside the collection chamber 18.

The capillary element 26 is inserted in a pipe 24, in such a way as to leave protruding from the pipe an upper end 27 extending inside the housing 10 and a lower end 28, facing the base 6 of the container 4.

The pipe 24 is attached to the bottom wall 11 of the housing 10, in correspondence with the aperture 22 of the cartridge 2 and can be kept in position, for example, by a rubber collar 15, forced into an aperture 25 in the bottom wall 11; the pipe 24 extends perpendicularly to the bottom wall 6 of the container 4, to a distance of approximately 2 - 5 mm from it.

The pipe 24, according to a preferred embodiment (Fig. 5), is attached to the bottom wall 11 of the housing 10 by means of a blocking member 29, consisting of a cylindrical cover, mounted upside down to seal a boss 32,

protruding from a bottom wall 11 of the housing 10; the cover 30 is provided with a hole 33 inside which the pipe 24 is rigidly attached.

The hydrostatic pressures inside the cartridge 2 and in the collection chamber 18 are reciprocally compensated by means of a compensating device 34, contained in the blocking member 29. The compensating device 34 comprises a flat, elastic lamina valve 36, which is attached compressed between a ring-like shoulder 37 of the cover 30 and the boss 32 of the bottom wall 11.

The lamina 36 includes a flexible, central portion 38, joined with an external ring-like part 40 of the same lamina, through a small, radial leg member, not shown in Fig. 5; the central portion is suitable for elastically assuming one or the other of two positions, when it is urged by the difference in hydrostatic pressure between the cartridge 2 and the collection chamber 18: when there is no difference in pressure between cartridge 2 and collection chamber 18, the portion 38 remains in a position of equilibrium, coplanar with the ring-like part 40; when there is a difference in pressure between cartridge 2 and collection chamber 18, the portion 38 flexes elastically to one side or the other with respect to the equilibrium position, enabling air to pass from the cartridge 2 to the collection chamber 18, or vice versa, through a hole 42 made in the cover 30 and communicating with the collection chamber 18 (Figs. 1 and 5).

Alternatively or in association with the use of the device 34, described above, compensation for differences in pressure between collection chamber 18

and cartridge 2 can also be provided by adopting a number of grooves 23 (Fig. 2) made inside the pipe 24.

According to a construction variant, the pipe 24 can be replaced by a rigid and impermeable sheath, surrounding the capillary element 26; according to this variant, the sheath containing the capillary element 26 is attached to the bottom wall 11 of the housing 10 by means of a plug of punctured elastic rubber, forced through the bottom wall 11.

The capillary element 26 is normally made from a preformed cylinder of spongy material, with communicating cells; alternatively, the capillary element 26 can be made of a bunch of fibres of synthetic or natural material, compressed longitudinally to form a cylindrical package suitable for being inserted in the pipe 24.

The collection chamber 18 communicates freely (Fig. 2) and continuously with a back-flow compartment 45, disposed in the top part of the container 4, adjacent to the top wall 7, and distributed all around the housing 10; the back-flow compartment 45 is sized such as to have a volume substantially at least equal to the volume of said predetermined quantity of ink 17 contained in the collection chamber 18; this solution, according to the invention, ensures that the cartridge 2 is fed, via the capillary element 26, solely and exclusively when the container 4 is in the vertical position on the support platform 9, and also means that ink running or

leaking outside the container 4 can be avoided, when the container 4 is in positions other than the vertical.

In addition the back-flow compartment 45, the collection chamber 18 and the predetermined quantity of ink 17 have their respective volumes proportionate in such a way that the capillary element 26 remains uncovered by ink 17, when the container 4 is in any position other than the vertical operating position P1.

Therefore when the container 4 is tilted on one side through at least 90° (position P2 in Fig. 4), the ink flows partially from the collection chamber 18 towards the back-flow compartment 45, and the ink remaining in the collection chamber 18 comes to a level where it does not lap against and therefore wet the capillary element 26, so that in this position P2 all risk of dripping is eliminated.

All the more so, when the container 4 is, for example, turned upside down, all the ink flows freely from the collection chamber 18 to the back-flow compartment 45, and accordingly the lower end 28 of the capillary element 26 is not covered by ink, thus in this position too, all risk of ink dripping from the upper end 27 inside the housing 10 is eliminated.

From the foregoing description, the advantages obtained from the station according to the present invention will be evident, with respect to similar solutions known in the state of the art, in that the station 1 described, by ensuring the feeding of the cartridge 2 solely and exclusively when the container 4 is in the vertical operating position P1, as defined above, avoids the ink being transferred

through the capillary element 26, when the container 2 is placed on its side (Fig. 4), or turned upside down.

In fact, in any position of the container 4 other than the vertical, for instance during transport, the capillary element 26 is kept separate from the ink which flows into the back-flow compartment 45, and does not transfer ink, thus avoiding overfeeding of the cartridge 2, or leakage of ink inside the housing 10, when the cartridge 2 is missing.

It remains understood that changes may be made to the storage and ink refilling station, according to the invention, or parts substituted, without departing from the scope of the invention.